



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION TO REISSUE :
U.S. PAT. NO. 4,912,155, :
ISSUED MARCH 27, 1990 :
SERIAL NO. :
FILED JUNE 13, 1991 :
FOR ANTIOXIDANT AROMATIC FLUORO- :
PHOSPHITES :

**SUPPLEMENTAL REISSUE PETITION,
DECLARATION AND POWER OF ATTORNEY**

I, Lester P.J. Burton, residing in New Castle County, State of Delaware, and citizen of Canada, hereby declare that:

1. I believe I am the original, first and sole inventor of the invention entitled ANTIOXIDANT AROMATIC FLUOROPHOSPHITES, described and claimed in the reissue application which was filed on June 13, 1991 and amended through August 25, 1992, and which was originally filed on February 27, 1987 as Application Serial No. 20,023, and which issued as U.S. Pat. No. 4,912,155 on March 27, 1990. Attached to this paper is an Attachment 1 showing a summary of all the amendment to the originally issued claims, and with all the matters in brackets deleted and underlined matter added, constitute the claims sought in this petition.

2. I have read and understand the contents of the above-identified specification, including the claims as amended by any amendments referred to above.

3. I hereby request that I may be allowed to surrender and do hereby assent to surrender the said U.S. Pat. No. 4,912,155, which is assigned in whole to my former employer, Ethyl Corporation, and request that the Patent may be reissued, upon the foregoing claims.

4. I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

5. I believe that the Patent may be wholly or partly inoperative or invalid by reason of my claiming more or less than I had a right to claim in the Patent; and that this was the result of error without any deceptive intention on the part of myself or my employer and assignee of the Patent. The errors relied upon are set forth in the paragraphs below, together with a specification of how and when the errors occurred.

6. I was unaware of any errors in the Patent until April 2, 1991, when I met with counsel, and certain errors were identified which are specified below. Other errors were disclosed to me during the course of the prosecution of this reissue application by way of the Examiner rejections.

Claim 1

7. I was assigned the task by my employer to discover new and useful antioxidants for organic materials, mainly polyolefin polymers, especially polypropylene. In the course of my work, I discovered aromatic fluorophosphites that were surprisingly good antioxidants and most surprisingly had far better hydrolytic stability than commercial antioxidants.

8. During the development of my invention, I had a librarian conduct a literature search to determine the state of the art. The search uncovered no indications that any aromatic fluorophosphites had ever been disclosed as antioxidants. Several aromatic fluorophosphite chemical structures had been disclosed in the prior art, but none of these were indicated to have any utility to the best of my knowledge. I summarized my results in a memo that on October 8, 1986, I sent to Joseph Odenweller, the attorney then responsible for prosecuting my patent application. That memo is attached as Attachment A.

9. I carefully reviewed the specifications and claims of the patent application which Mr. Odenweller prepared. However, in reviewing the claims, I failed to compare the claims against the prior art structures that I had previously uncovered. Having disclosed the structures to the attorney handling the patent application, I simply assumed that the attorney had taken the necessary steps in view of my invention and the prior art. I have limited knowledge of patent law, and relied on the attorney handling the prosecution to make certain that all patent law requirements were met.

10. I am now informed that Mr. Odenweller had apparently misunderstood my memo Attachment A. The memo summarized the results of an STN International computerized search. The results provide the structure, and, if the structure appeared only before 1967 there are "0 references" cited, but if the structured appeared in 1967 or after, references are cited. In my memo Attachment A, I had indicated for some structures that there were "0 ref", which meant as indicated above. I am informed that Mr. Odenweller understood that "0 ref" meant that the structure did not appear in the prior art. Unfortunately, I never discussed this memo with any attorney during the prosecution, and, therefore, never explained the import of my notations.

Upon further review of the literature search results, I have also discovered that I overlooked and omitted in my memo certain aromatic fluorophosphite chemical structures that were in the computerized survey. I am now also informed that the attorney inadvertently failed to take into account all the prior art chemical structures that I did supply to him. I believe that these inadvertent failures led to claim 1 of the Patent to potentially claim chemical compounds that were disclosed in the prior art.

11. I have now also been shown certain prior art of which I have no recollection of being aware at the time that my original patent application was filed. That art is stated in the Information Disclosure Statement that I understand was filed together with the original reissue petition.

12. More specifically, I verily believe that the original issued claim 1 may claim chemical compounds within Formulas V, VI, III or IV which were in the above prior art disclosures, and claim 1 should be further limited by deleting those Formulas V, VI, III and IV. In addition, with regard to claim 1 Formula IV, the Examiner rejected this part of the claim under §112 during his first Office Action of the reissue application. Formula IV was also cancelled in order to avoid this §112 rejection of the claim. I became aware of this problem only after the Examiner rejected this formula during the reissue application.

13. In claim 1, the Examiner also noted a typographical error in that "substituent" should have been "substituents". This error arose during the patent application of issued patent 4,912,155. The first time I was aware of the error was after the Examiner rejected the claim during the prosecution of the reissue application.

14. Further, with respect to claim 1, Formula II, the Examiner rejected the claim in view of §112 and requested that the first and second "aryl" be defined and "hydroxy" be deleted from the claim as unsupported in terms of how to make such compounds. I was not aware of these §112 defects in the claim until the Examiner brought them to my attention. The first "aryl" was substituted with "phenyl" which is clearly supported by the specification and examples, and the second "aryl" was also defined as set forth in the specification. In the course of making the above corrections, it was brought to my attention that the punctuation should be corrected in that ":" should be ",". I was not aware that my choice of the terms "aryl" or inclusion of "hydroxy" would create §112 problems until the matter was brought to my attention after the filing of the original reissue application. I now see the errors, and wish to have them corrected.

Claims 2-4 and 6

15. With regard to claims 2 through 4 and 6 the claims had to be cancelled since they depended upon cancelled formulas in claim 1. The Examiner pointed out during the prosecution that the prior art discloses the compound of claim 2. Therefore, I believe that this claim should be cancelled. I became aware of this problem only after the Examiner rejected this formula during the reissue application.

16. Claims 3, 4 and 6, were not rejected over the prior art. These claims were allowable and rewritten in the independent format as claim 43.

Claim 8

17. Claim 8 was amended in view of U.S.S.R. Authorship Certificate 398,574. The amendment makes more clear that the antioxidants of the invention are added to the organic

materials by mixing or spraying and are not substantially reacted with the organic materials, as is shown in the U.S.S.R. Authorship Certificate. I first became aware of the U.S.S.R. Authorship Certificate on April 2, 1991. I now recognize that the use of the term "containing" might potentially cause the claim to read on the reaction of antioxidant with the organic composition, which was not my intent. During prosecution of the reissue application, I also, first became aware that the limitation that the said organic material be a "polymer of an olefinically unsaturated monomer" (the limitation of claim 10) was required to be inserted into claim 8 to avoid a possibility that the prior art (Baranauckus and Spivak) read on claim 8.

Claim 9

18. Claim 9 was amended in view of §112 rejections made for the first time during the prosecution of said reissue application. Claim 9 Formulas I, II and III needed to be corrected for the same reason as stated in paragraph 14, above. The above paragraph 14 is here incorporated by reference. Claim 9 Formula IV was rejected by the Examiner because the specification did not sufficiently demonstrate how to make a compound with the "OH" substituents. I was not aware of that error until the Examiner's rejection was brought to my attention, but now recognize that Formula IV should be deleted. In addition the word "from" was misspelled as "rom". This error occurred during the printing of the patent. There was also another typographical error in that "R₃" should have been "R³" in the first line under Formula III. I first became aware of these errors during the prosecution of the reissue application.

Claim 10

19. Claim 10 had to be cancelled since claim 10 did not further limit amended claim 8. The limitation of claim 10 was inserted into claim 8. Therefore, this claim had to be cancelled.

Claim 11

20. Claim 11 has been amended to depend on newly added claim 44. Newly added claim 44 now restates what had been the "Formula II" portion of original claim 9. The error here is further explained in the discussion of the addition of claims 44 later in this paper. This amendment occurred during the prosecution of the reissue application. I first became aware of this error during the prosecution of the reissue application.

Claim 12

21. Claim 12 has been amended to depend directly from claim 9, and has been limited to a substituted "R" phenyl group. The errors arose as follows: first, it became apparent during the prosecution that there was no claim directly covering an organic composition with a Formula I compound with substituted phenyl groups, which is one of the preferred embodiments of my invention. Formula I with substituted phenyl groups in the R positions is reflected in the specification. The error of failing to make such composition a specific embodiment first became apparent during the prosecution of the reissue application. The claim had to be changed to be dependent directly on claim 9, rather than claim 11, because the previous limitation that the polymer be of an olefinically unsaturated monomer, which was originally contained in claims 10 and 11, was now incorporated into claim 9, and claim 11 was not made dependent on claim 44.

Claims 13 and 14

22. Claims 13 and 14 have been amended in order to obviate the §112 objections. The first time I became aware of the errors in these claims was during the prosecution of the reissue application. Further the "alkoxycarbonyl" substituents have been deleted to further differentiate the claim from the previously cited Spivak '855 reference. This change was brought about during the prosecution of the reissue application.

Claims 17, 19 and 24

23. Claims 17, 19 and 24 have been amended to obviate the §112 rejection brought to my attention for the first time during the reissue prosecution after the Examiner rejected the claims. The error and the amendments to claim 19 are the same as shown in paragraph 14 above, and paragraph 14 is here incorporated by reference. Further, the word "atoms" was misspelled in the claim issued as "toms", which, I believe was a typographical error in the printing.

Claim 23 and 24

24. Typographical errors in claims 23 and 24 are corrected. The errors were not my fault, but arose in the printing of the original patent by the Patent and Trademark Office. Further, claim 24 contained the same errors as described in paragraph 14 above, and the same amendments were made that are described in paragraph 14. Above paragraph 14 is here incorporated by reference.

Claims 25-31, 41 and 42

25. Claims 25-31, 41 and 42 were rejected over the prior art for the first time during the prosecution of the reissue application. These claims were rejected October 7, 1991, on page

8 of the Office Action. This is the first time I became aware of the error related to these claims. To expedite prosecution, it was deemed preferable to concede these claims, as opposed to amending the claims to avoid the prior art cited by the Examiner.

Claim 43

26. Claim 43 was added to incorporate the dependent claims 3, 4 and 6 which had to be cancelled since they depended upon cancelled formulas in claim 1 into the independent format. However, these claims were not rejected over the prior art. These claims were allowable and rewritten in the independent format as claim 43. The new claim 43 had to be added to save the otherwise valid claims 3, 4 and 6, which were defective only in that they were dependent from formulas of claim 1 which were overbroad in view of the prior art. The error of claim is detailed in paragraphs 7 through 13, which are incorporated by reference.

Claim 44

27. Newly added claim 44 is essentially of the same scope as was original claim 19 and is of the same scope as the "Formula II" portion of claim 9. Claim 44 had to be added because of errors that occurred in claims 8 and 9, and which are detailed above in paragraphs 17 through 18, which are incorporated by reference. Because of the amendments which had to be made because of errors in claims 8 and 9, as detailed above, the invention of new claim 44, which was covered by the "Formula II" part of originally issued claim 9, was no longer covered by any claim. Therefore, claim 44 had to be added to save the invention which was clearly and specifically disclosed in the specification and which was covered by the originally issued claim 9, Formula II. The first time that it was recognized that claim 44 was needed was when the errors of claims 8 and 9 were disclosed by the Examiner during the present prosecution, and the

original invention of claim 9, Formula II was found to be valid, allowable and no longer covered by the amended claims. Claim 44 does not have the additional limitation of the currently amended claim 8 -- i.e., limiting the "organic material normally susceptible to gradual oxidative degradation" to "being a polymer of an olefinically unsaturated monomer", because claim 8 is inclusive of other antioxidants of, for example, Formulas I and III, while claim 44 is limited to Formula II antioxidants. The limitation had to be included in claim 8 in view of the prior art, but claim 44 is not subject to the same consideration.

28. The specification contains corrections to typographical errors in the printed original patent, which errors were not my fault but arose in the printing by the Patent and Trademark Office.

29. At Cols. 15 and 16, I have also deleted the disclosure of the alternate use of PBr_3 in making an intermediate in the making of my invention. At the time I originally filed my application I believed that PBr_3 might be a useful reactant. I have since discovered that PBr_3 does not appear to work in the reaction.

30. A terminal disclaimer had to be filed in view of Patent No. 4,867,907 which issued prior to Patent No. 4,912,155 (the application involved in the reissue). Patent No. 4,912,155 has an earlier filing date. The Examiner pointed out during the prosecution of the reissue application that double patenting existed. This was the first time I was aware of the double patenting rejection. A terminal disclaimer was filed in order to overcome this rejection.

31. As present advised and based on my best recollection, the material listed as offered for sale in the Babullis patent (US Patent No. 4,962,144) at column 3 line 5, was not offered

for sale more than 1 year before the filing of the original application and in fact was offered for sale after the filing of the patent application of Patent No. 4,912,155.

32. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.


33. I hereby appoint the following attorneys or agents to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Rudolf E. Hutz, Reg. No. 22,397; Thomas M. Meshbesh, Reg. No. 30,982; Robert G. McMorrow, Reg. No. 30,962; Ashley I. Pezzner, Reg. No. 35,646; Philip M. Pippenger, Reg. No. 25,525 and Richard L. Hansen, Reg. No. 27,338.

Address all telephone calls to Rudolf E. Hutz at telephone no. (302) 658-9141.

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Date: March 31, 1993


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ATTACHMENT 1

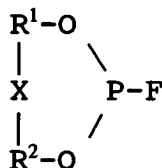
1. An aromatic fluorophosphorus compound suitable for use as an antioxidant said compound being selected from fluorophosphorus compounds having the structure:



wherein R is an substituted aryl group wherein the substituents are tert-alkyl groups:

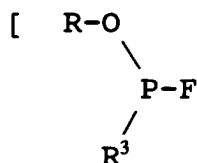


wherein R' is a substituted aryl group wherein the substituents are selected from sec-alkyl, tert-alkyl, aralkyl, cycloalkyl, hydroxy, alkoxy, aryloxy, halo, acyloxy, and alkoxy carbonyl alkyl:]



Formula II

wherein R¹ and R² are substituted or unsubstituted [aryl] phenyl groups wherein the [substituent] substituents are selected from alkyl, aryl, aralkyl, cycloalkyl, [hydroxy,] alkoxy, aryloxy, and halo[:], and X is selected from the group consisting of a single bond connecting R¹ and R² and divalent bridging groups selected from divalent aliphatic hydrocarbon groups containing 1-12 carbon atoms, —O— and —S_q— wherein q is an integer from 1 to 3[:], and wherein aryl is selected from the group consisting of phenyl, o-tolyl, p-tolyl, naphthyl, 4-phenylphenyl and 4-sec-hexylphenyl.



Formula III

wherein R is a substituted or unsubstituted aryl group wherein the substituents are selected from alkyl, aryl, aralkyl, cycloalkyl, hydroxy, alkoxy, aryloxy, halo, alkoxy carbonyl, alkoxy carbonyl-alkyl and acyloxy, and R³ is selected from the group consisting of alkyl, cycloalkyl, aralkyl, aryl, substituted aryl, alkoxy, cycloalkoxy and aralkoxy; and

wherein R^5 and R^6 are hydrogen or alkyl having 1-12 carbon atoms, y is an integer from 2 to 3, x is an integer from 1 to 3, t is an integer from 2 to 3, u is an integer from 0 to 4 ($t+u$) equals 2 to 6, w is an integer from 1 to 4, R^7 is hydrogen or an alkyl having 1 to 6 carbon atoms, R^8 is an aliphatic hydrocarbon radical having 1-30 carbon atoms and having valence w , v is an integer from 0-4, R^9 is an aliphatic hydrocarbon radical having 1 to 6 carbon atoms and having valence y .]

[27. A composition of claim 26 wherein said fluorophosphorus compound is 2,5-di-tert-butyl-1,4-phenylene bis (difluorophosphite).]

[28. A composition of claim 26 wherein said fluorophosphorus compound is 4,4'-methylenebis(2,6-di-tert-butylphenyl) bis(difluorophosphite).]

[29. A composition of claim 26 wherein said fluorophosphite compound is the tris(difluorophosphite ester) of 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-2,4,6-trimethyl benzene.]

[30. A composition of claim 26 wherein said fluorophosphorus compound is the tetrakis(difluorophosphite ester) of tetrakis(methylene 3-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate)methane.]

[31. A composition of claim 26 wherein said fluorophosphite compound is difluorophosphite ester of octadecyl 3-(3,5-di-tert-butylhydroxyphenyl)propionate.]

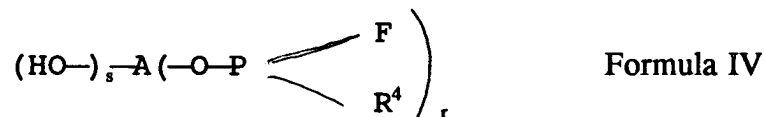
32. An organic composition of claim 8 further characterized by containing about 0.005-5 wt. percent of a phenolic antioxidant.

33. An organic composition of claim 9 further characterized by containing about 0.005-5 wt. percent of a phenolic antioxidant.

34. An organic composition of claim 12 further characterized by containing about 0.005-5 wt. percent of a phenolic antioxidant.

35. An organic composition of claim 15 further characterized by containing about 0.005-5 wt. percent of a phenolic antioxidant.

36. An organic composition of claim 16 further characterized by containing about 0.005-5 wt. percent of a phenolic antioxidant.



Formula IV

wherein A is a mono- or poly-nuclear aromatic group, R^4 is independently selected from fluorine, aryloxy, alkylaryloxy, alkoxy and polyalkoxy, r is an integer from 1 to 4, s is an integer from 0 to 3 and $(r + s)$ equals the valence of A.]

[2. A compound of claim 1 namely bis(2,6-di-tertbutylphenyl) fluorophosphite.]

[3. A compound of claim 1 namely: bis(2,4-di-tertbutylphenyl) fluorophosphite.]

[4. A compound of claim 1 namely bis(4-octadecyloxycarbonylethyl-2,6-di-tert-butylphenyl) fluorophosphite.]

5. A compound of claim 1 namely: 2,2'-ethylidenebis(4,6-di-tert-butylphenyl) fluorophosphite.

[6. A compound of claim 1 namely: bis-difluorophosphite ester) of 4,4'-methylenebis(2,6-di-tert-butylphenol).]

7. A compound of claim 1 namely: 2,2'-bis(4,6-di-tert-butylphenyl) fluorophosphite.

8. Organic material normally susceptible to gradual oxidative degradation when in contact with oxygen, said organic material being a polymer of an olefinically unsaturated monomer and having incorporated therein by mixing or spraying [containing] an antioxidant amount of an aromatic fluorophosphorus compound, said compound being characterized by having at least one benzene group bonded through oxygen to a trivalent phosphorus atom and at least one fluorine atom bonded to said phosphorus atom.

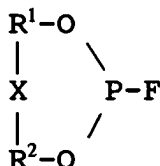
9. An organic composition of claim 8 wherein said fluorophosphorus compound is selected from the group consisting of compounds having the structures:



Formula I

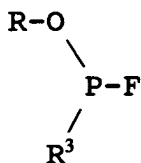
wherein R is a substituted or unsubstituted [aryl] phenyl group wherein the substituents are selected from alkyl, aryl, aralkyl, cycloalkyl, [hydroxy,] alkoxy, aryloxy, halo, alkoxycarbonyl,

alkoxycarbonylalkyl and acyloxy and n is 1 or 2, and wherein aryl is selected from the group consisting of phenyl, o-tolyl, p-tolyl, naphthyl, 4-phenylphenyl and 4-sec-hexylphenyl;



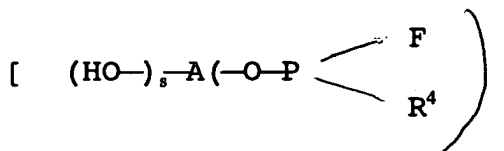
Formula II

wherein R^1 and R^2 are substituted or unsubstituted [aryl] phenyl groups wherein the substituents are selected from alkyl, aryl, aralkyl, cycloalkyl, [hydroxy,] alkoxy, aryloxy and halo, and X is selected [rom] from the group consisting of a single bond connecting R^1 and R^2 and divalent bridging groups selected from divalent aliphatic hydrocarbons containing 1-12 carbon atoms, —O— and $\text{—S}_q\text{—}$ wherein q is an integer from 1 to 3[;], and wherein aryl is selected from the group consisting of phenyl, o-tolyl, p-tolyl, naphthyl, 4-phenylphenyl and 4-sec-hexylphenyl; and



Formula III

wherein R is as previously defined for Formula I and $[\text{R}_3]$ R^3 is selected from the group consisting of alkyl, cycloalkyl, aralkyl, aryl, substituted aryl, alkoxy, cycloalkoxy, aryloxy and aralkoxy[; and], and wherein aryl is selected from the group consisting of phenyl, o-tolyl, p-tolyl, naphthyl, 4-phenylphenyl and 4-sec-hexylphenyl.



Formula IV

wherein A is a mono or polynuclear aromatic group, R^4 is independently selected from fluorine, aryloxy, alkaryloxy, alkoxy and polyalkoxy and r is an integer from 1 to 4, s is an integer from 0 to 3 and $(r+s)$ equals the valence of A].

[10. A composition of claim 8 wherein said organic material is a polymer of an olefinically unsaturated monomer.]

11. A composition of claim [9] 44 wherein said organic material is a polymer of an olefinically unsaturated monomer.

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12. A composition of claim [11] 9 wherein said compound has Formula I[.] , and R is a substituted phenyl group.

13. A composition of claim 12 wherein n is 2 and said substituents are selected from alkyls having 1-20 carbon atoms, [aryls having 6-12 carbon atoms] phenyl, o-tolyl, p-tolyl, naphthyl, 4-phenylphenyl, 4-sec-hexylphenyl, aralkyls having 7-12 carbon atoms, cycloalkyls having 5-8 carbon atoms, [hydroxy,] alkoxy having 1-12 carbon atoms, aryloxy having 6-12 carbon atoms, halo, [alkoxycarbonylalkyl having 1-20 carbon atoms in its alkoxy moiety and 1-3 carbon atoms in its alkyl moiety, alkoxycarbonyl having 1-20 carbon atoms in its alkoxy moiety] and acyloxy having 1-4 carbon atoms.

14. A composition of claim 13 wherein said substituents are selected from alkyl having 1-20 carbon atoms [and alkoxy carbonylalkyl having 1-20 carbon atoms in its alkoxy moiety and 4 1-3 carbon atoms in its alkyl moiety].

15. A composition of claim 14 wherein said fluorophosphite compound is bis(2,6-di-tert-butylphenyl) fluorophosphite.

16. A composition of claim 14 wherein said fluorophosphite is bis(2,4-di-tert-butylphenyl) fluorohphosphite.

17. A composition of claim [14] 12 wherein said fluorophosphite compound is bis(4-octadecyloxycarbonyl-ethyl-2,6-di-tert-butylphenyl) fluorophosphite.

18. A composition of claim 12 wherein n is 1.

19. A composition of claim 9 wherein said fluorophosphite compound has Formula II wherein said substituents are selected from alkyl having 1-20 carbon atoms, [aryl having 6-12 carbon atoms,] phenyl, o-tolyl, p-tolyl, naphthyl, 4-phenylphenyl, 4-sec-hexylphenyl, aralkyl having 7-12 carbon atoms, cycloalkyl having 5-8 carbon atoms, [hydroxy,] alkoxy having 1-12 carbon [toms] atoms, aryloxy having 6-12 carbon atoms and halo, and X is selected from the group consisting of a single bond connecting R¹ and R² and divalent bridging groups selected from divalent aliphatic hydrocarbon groups containing 1-12 carbon atoms, -O- and -S_q- wherein q is an integer from 1-3.

20. A composition of claim 19 wherein said substituent groups are alkyls containing 1-20 carbon atoms.

21. A composition of claim 20 wherein said fluorophosphorus compound is 2,2'-ethylidenebis(4,6-di-tert-butylphenyl) fluorophosphite.

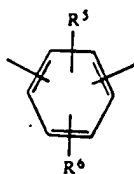
22. A composition of claim 20 wherein said fluorophosphorus compound is 2,2'-methylenebis (4-methyl-6-tert-butylphenyl) fluorophosphite.

23. A composition of claim 20 wherein said fluorophosphite compound is [22,2,] 2,2'-bis(4,6-di-tert-butylphenyl) fluorophosphite.

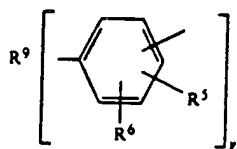
24. A composition of claim 9 wherein said fluorophosphorus compound has Formula III wherein said substituents are selected from alkyls having 1-20 carbon atoms, [aryls having 6-12 carbon atoms,] phenyl, o-tolyl, p-tolyl, naphthyl, 4-phenylphenyl, 4-sec-hexylphenyl, aralkyls having 7-12 carbon atoms, cycloalkyls having 5-8 carbon atoms, [hydroxy,] alkoxy having 1-12 carbon atoms, aryloxy having 6-12 carbon atoms, halo, alkoxycarbonylalkyl having 1-20 carbon atoms in its alkoxy moiety and 1-3 carbon atoms in its alkyl moiety, alkoxycarbonyl having 1-20 carbon atoms in its alkoxy moiety and acyloxy having 1-4 carbon atoms, and R³ is selected from alkyl having 1-20 carbon atoms, cycloalkyl having 5-8 carbon atoms and aralkyls having 7-12 carbon atoms which are bonded through [oxygen] oxygen to phosphorus and aryls having 6-12 carbon atoms, alkyl having 1-20 carbon atoms, cycloalkyls having 5-8 carbon atoms and aralkyls having 7-12 carbon atoms which are bonded directly to said phosphorus.

[25. A composition of claim 9 wherein said fluorophosphorus compound has Formula IV.]

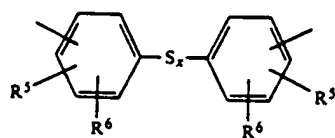
[26. A composition of claim 25 wherein A has a structure selected from:



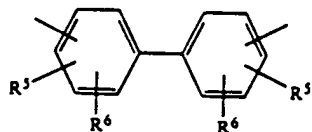
Structure IV (i)



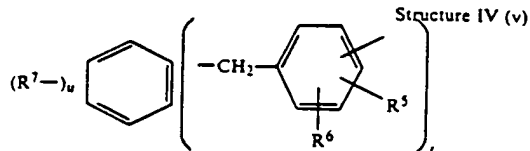
Structure IV (ii)



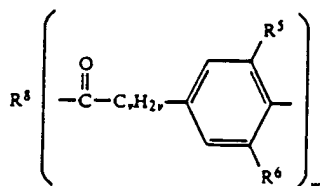
Structure IV (iii)



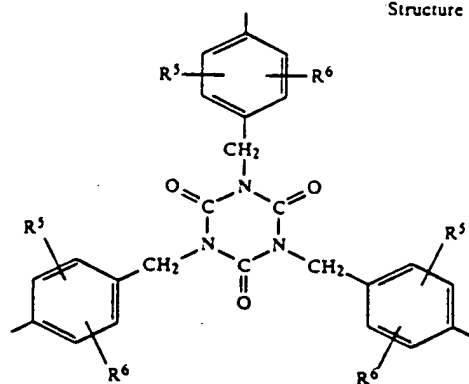
Structure IV (iv)



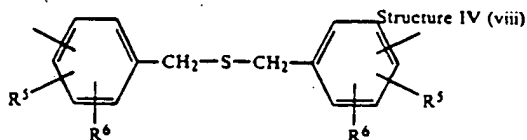
Structure IV (v)



Structure IV (vi)



Structure IV (vii)



Structure IV (viii)

37. An organic composition of claim 17 further characterized by containing about 0.005-5 wt. percent of a phenolic antioxidant.

38. An organic composition of claim 19 further characterized by containing 0.005-5 wt. percent of a phenolic antioxidant.

39. An organic composition of claim 21 further characterized by containing 0.005-5 wt. percent of a phenolic antioxidant.

40. An organic composition of claim 39 wherein said phenolic antioxidant is 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene.

[41. An organic composition of claim 39 further characterized by containing about 0.005-5 wt. percent of a phenolic antioxidant.]

[42. An organic composition of claim 25 further characterized by containing about 0.005 -5 wt. percent of a phenolic antioxidant.]

--43. A aromatic fluorophosphorus compound suitable for use as an antioxidant, said compound being selected from the group consisting of bis(2,4-di-tert-butylphenyl) fluorophosphite; bis(4-octadecyloxycarbonyl-2,6-di-tert-butylphenyl) fluorophosphite; and 4,4'-methylenebis(2,6-di-tert-butylphenyl)bis (difluorophosphite).--

--44. A compound of claim 1 combined in an antioxidant amount with an organic material normally susceptible to gradual oxidative degradation when in contact with oxygen.--

300.

10/15/91

The following represents
what I know of the
situation. If you want to
know more, please contact
me.

LPSB

Attachment A
to
Declaration of Lester P.J. Burton

ETHYL CORPORATION

INTER-OFFICE

To K A Kcblys

ADDRESS ETC

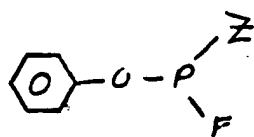
FROM LPT Burton

ADDRESS ETC

SUBJECT Fluorophosphites

DATE 12/10/85

A computer search of the substructure PhOPF was executed. The search yielded 171 structures and 52 references. The majority of the hits were metal complexes, phosphates or pentacoordinate species. No reference to antioxidant activity was found. The arylfluorophosphites found are listed below:



a) $\text{Z} = \text{O}-\text{C}_6\text{H}_5$ 3 ref

b) $\text{O}-\text{C}_6\text{H}_4$ 0 ref

c) $\text{O}-\text{C}_6\text{H}_3$ 1 ref

d) $\text{O}-\text{C}_6\text{H}_2$ 0 ref

e) OMe 0 ref

f) $\text{O}-\text{Pr}$ 0 ref

g) $\text{O}-n\text{-Bu}$ 0 ref

Ar_2PF

h) $\text{Ar} = \text{O}-\text{C}_6\text{H}_4-\text{OMe}$

i) $\text{O}-\text{C}_6\text{H}_4-\text{OMe}$

CC RL Shubkin
JC Willenack

(RR'N)₃P (NHR' could be in place of RR'N). Named in connection with the antistatic treatment of plastics.¹¹⁹
 s-Hexamethylene-diaminophosphite. Named in connection with the production of profiled plastic strips which are weather and light stable.¹¹⁹
 O,O-diethyl N,N-diethylphosphoramidite. Used for the preparation of pesticides.⁴⁸
 Amides and imides of phosphorous acid. Catalyze the polymerization of formaldehyde to high molecular weight poly(oxy methylenes).¹²⁷
 Polycondensates from PCl₃ and such as hexamethylene diamine. Applicable as ion exchangers.²⁴⁸
 (R₂N)₃P, R = Me, Et, Pr, Bu, especially Me. Improve leaded gasoline with regard to preignition and octane number.⁶⁶²
 Di-Et N-(2,4-diMe-phenyl) phosphoramidite. Is an additive for motor gasoline, improving the octane number, and minimizing combustion zone deposits without lowering the octane number.²⁴¹
 "N,N',N''-(trioctylphenyl)phosphorous triamide" "Di-Bu-N-phenyl amidophosphite." Named as antiknock additives for gasoline.²⁸⁹
 PhOP(NCO)₂. Named in connection with pigmented polyurethane coating compositions having improved viscosity stability.⁶²⁰

I. LIST OF COMPOUNDS

I.1. Phosphites

I.1.1. Difluorophosphites

TYPE: ROPF₂

CH₃OPF₂. ³¹P -111 ppm, J_{PF} 1275 Hz.⁶²⁸
 F₂POCH₂CH₂OPF₂. (CH₂OP)₂Cl₄ + SbF₃. b₁₈₀ 50°, n_D²⁶ 1.3523, ¹⁹F NMR, ¹²⁴⁹ ³¹P -112.0 ppm, J_{PF} 1295 Hz.¹²⁰⁹, ¹²⁴⁹
 ProPF₂. ROPCl₂ + SbF₃. b. 44.5°, n_D²⁰ 1.3400, ¹⁹F NMR, ¹²⁴⁹ ³¹P -111.5 ppm, J_{PF} 1287 Hz.¹²⁰⁹, ¹²⁴⁹
 CH₂:CHCH₂OPF₂. ROPCl₂ + SbF₃. b. 42°, ¹⁹F NMR, ¹²⁴⁹ ³¹P -111.9 ppm, J_{PF} 1290 Hz.¹²⁰⁹, ¹²⁴⁹
 BuOPF₂. ROPCl₂ + SbF₃. b. 75°, n_D²⁰ 1.3580, ¹²⁴⁹ ³¹P -111.9 ppm, J_{PF} 1288 Hz.¹²⁰⁹
 PhOPF₂. PhOPCl₂ + SbF₃. b₆₀ 58°, n_D²⁷ 1.4575, ¹⁹F NMR, ¹²⁴⁹ ³¹P -110.1 ppm, J_{PF} 1326 Hz.¹²⁰⁹, ¹²⁴⁹
 1,4-C₆H₄(OPF₂)₂. -PCl₂ + SbF₃. b₁₂ 59°, n_D²³ 1.4488, ¹⁹F NMR, ¹²⁴⁹ ³¹P -109.8 ppm, J_{PF} 1328 Hz.¹²⁰⁹, ¹²⁴⁹

I.1.2. Monofluorophosphites

OCH₂CH₂OPF. (RO)₂PCl₂. b₁₈ 26°, ¹²⁰¹ d₄²⁰ 1.4039, MR_D 19.90, -124.4 ppm, J_{PF} 1275 Hz.
 OCH(Me)CH₂OPF. (RO)₂PCl₂. n_D²⁰ 1.4035, MR_D 24.90
 OCH(Me)CHMeOPF. (RO)₂PCl₂. n_D²⁰ 1.4020, MR_D 29.90
 OCH(Me)CH₂CH₂OPF. (RO)₂PCl₂. n_D²⁰ 1.4160, MR_D 29.90
 OCH₂.C(Et)(Bu)CH₂OPF. n_D²⁰ 1.1241, n_D²⁰ 1.4765, NMR. ¹²⁶¹
 OCH₂(CH₂)₂CH₂OPF. (RO)₂PCl₂. n_D²⁰ 1.4450, MR_D 30.90
 OCH₂(CH₂)₄CH₂OPF. (RO)₂PCl₂. n_D²⁰ 1.4270, MR_D 39.90
 OCH₂(CH₂)₈CH₂OPF. (RO)₂PCl₂. n_D²⁰ 1.4798, MR_D 57.90
 1,2-C₆H₁₀O₂PF. (RO)₂PCl₂. n_D²⁰ 1.4586, MR_D 36.90
 1,2-C₆H₄O₂PF. (RO)₂PCl₂. b₆ 36.5°, ¹²⁴⁹ b₆ 36.5°, ¹²⁴⁹ n_D²⁷ 1.5080, ¹²⁴⁹ ¹⁹F NMR, ¹²⁴⁹ 31P -111.9 ppm, J_{PF} 1288 Hz.
 JPOCCH ca. 1 Hz, ¹²⁴⁹
 3-Me-1,2-C₆H₃O₂PF. (RO)₂PCl₂. n_D²⁰ 1.5170, MR_D 39.90
 4-Me-1,2-C₆H₃O₂PF. (RO)₂PCl₂. n_D²⁰ 1.5220, MR_D 39.90
 1,2-C₆H₄C(:O)OPF. (RO)₂PCl₂. n_D²⁵ 1.5390.¹²⁴⁹
 I.1.3. Dichlorophosphites
 TYPE: ROPCl₂
 CD₃OPCl₂. Ib. b₆₀ 31.90
 MeOPCl₂. Ia. b₇₅₈ 95.90
 1.47725, ²⁹⁹, ⁷⁴⁸ 31.90
 C₆H₅CH(CO₂Et)OPCl₂. I. 1.2720, n_D²¹ 1.5259
 (-)-mandelate α_D²⁰

Phosphorous Acid

of RR'N). Named in connection with treatment of plastics.¹⁴⁴

Named in connection with plastic strips which

didite. Used for the

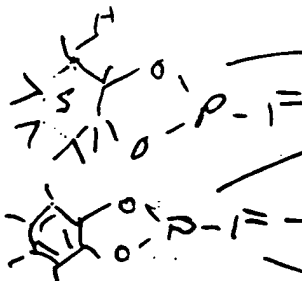
acid. Catalyze the reaction to high molecular

as hexamethylene diamine. ²⁴⁸ Improves the octane number, improves preignition and octane

amidite. Is an additive for improving the octane number, deposits without lower-

as triamide "Di-Bu-N" as antiknock additives

with pigmented polyurethane, improving improved viscosity



²⁴⁸ ¹H NMR, ¹²⁰⁹, ¹²⁴⁹ ppm, J_{PF} 1295 Hz.

¹⁹F NMR, ¹²⁴⁹ ppm, J_{PF} 1295 Hz.

³¹P NMR, ¹²⁴⁹ ppm, J_{PF} 1295 Hz.

¹⁹F NMR, ¹²⁴⁹ ppm, J_{PF} 1295 Hz.

List of Compounds 149

I.1.2. Monofluorophosphites with P in Ring System

$\text{OCH}_2\text{CH}_2\text{OPF}_2$. (RO)₂PCl + SbF₃. ¹⁰⁶⁴, ¹²⁰¹, ¹²⁴⁹ b₁ 70°, 48°, ¹²⁴⁹ n_D²⁰ 1.4003, ¹²⁴⁹ n_D²⁵ 1.4039, MR_D 19.90 (20.56), ¹²⁰¹ ¹⁹F NMR, ¹²⁴⁹ 31P -124.4 ppm, J_{PF} 1223 Hz, ¹²⁰⁹, ¹²⁴⁹ ¹H NMR. ⁴³²

$\text{OCH}(\text{Me})\text{CH}_2\text{OPF}_2$. (RO)₂PCl + SbF₃. b₁ 100°, 44°, d₄²⁰ 1.2226, n_D²⁰ 1.4035, MR_D 24.78 (25.18), ¹⁰⁶⁴, ¹²⁰¹ IR. ¹²⁰¹

$\text{OCH}(\text{Me})\text{CHMeOPF}_2$. (RO)₂PCl + SbF₃. b₁ 100°, 28°, d₄²⁰ 1.1568, n_D²⁰ 1.4020, MR_D 29.08 (29.79). ¹²⁰¹

$\text{OCH}(\text{Me})\text{CH}_2\text{CH}_2\text{OPF}_2$. (RO)₂PCl + SbF₃. b₁ 100°, 37°, d₄²⁰ 1.1857, n_D²⁰ 1.4160, MR_D 29.22 (29.79). ¹²⁰¹

$\text{OCH}_2\text{C}(\text{Et})(\text{Bu})\text{CH}_2\text{OPF}_2$. (RO)₂PCl + SbF₃. b₁ 61°, d₄²⁰ 1.1241, n_D²⁰ 1.4765, MR_D 52.28 (52.88), ¹²⁰¹ ¹H NMR. ¹²⁰¹

$\text{OCH}_2(\text{CH}_2)_2\text{CH}_2\text{OPF}_2$. (RO)₂PCl + SbF₃. b₁ 100°, 38°, d₄²⁰ 1.2180, n_D²⁰ 1.4450, MR_D 30.16 (29.80), ¹²⁰¹ IR, ¹²⁰¹ ¹H NMR. ¹²⁰¹

$\text{OCH}_2(\text{CH}_2)_4\text{CH}_2\text{OPF}_2$. (RO)₂PCl + SbF₃. b₁ 100°, 66°, d₄²⁰ 1.0840, n_D²⁰ 1.4270, MR_D 39.94 (39.03). ¹²⁰¹

$\text{OCH}_2(\text{CH}_2)_8\text{CH}_2\text{OPF}_2$. (RO)₂PCl + SbF₃. b₂ 80°, d₄²⁰ 1.1041, n_D²⁰ 1.4798, MR_D 57.09 (57.50). ¹²⁰¹

1,2-C₆H₁₀O₂PF₂. (RO)₂PCl + SbF₃. b₁ 100°, 34°, d₄²⁰ 1.2140, n_D²⁰ 1.4586, MR_D 36.93 (36.83), ¹²⁰¹ ¹H NMR. ¹²⁰¹

1,2-C₆H₄O₂PF₂. (RO)₂PCl + SbF₃. ¹²⁰¹, ¹²⁴⁹ or + NaF. ¹²⁴⁹ b₁ 36.5°, ¹²⁴⁹ b₂ 38°, ¹²⁰¹ d₄ 1.3592, ¹²⁰¹ n_D²⁵ 1.5092, ¹²⁰¹ n_D²⁷ 1.5080, ¹²⁴⁹ n_D²⁰ 1.5160, MR_D 35.13 (35.43), ¹²⁰¹ ¹⁹F NMR, ¹²⁴⁹ 31P -123.1 ppm, J_{PF} 1305 Hz, ¹²⁰¹ ¹H NMR, ¹²⁰¹ J_{POCCH} ca. 1 Hz, J_{POCCCH} < 0.5 Hz. ¹²⁰⁹, ¹²⁴⁹

3-Me-1,2-C₆H₃O₂PF₂. (RO)₂PCl + SbF₃. b₂ 58°, d₄²⁰ 1.3045, n_D²⁰ 1.5170, MR_D 39.94 (calc. 40.04). ¹²⁰²

4-Me-1,2-C₆H₃O₂PF₂. (RO)₂PCl + SbF₃. b₇ 84°, d₄²⁰ 1.3150, n_D²⁰ 1.5220, MR_D 39.92 (calc. 40.04). ¹²⁰²

1,2-C₆H₄C(:O)OPF₂. (RO)₂PCl + KSO₂F. b_{0.15-0.2} 44-7°, n_D²⁵ 1.5390. ¹²⁴⁹

I.1.3. Dichlorophosphites

TYPE: ROPCl₂

CD₃OPCl₂. Ib. b₄₀ 31-2°, d₄²⁴ 1.3892, n_D²⁴ 1.4682. ¹⁵⁷ MeOPCl₂. Ia. b₇₅₃ 95-6°, d₄²⁰ 1.4275, d₄²⁵ 1.3980, n_D²⁰ 1.47725, ¹²⁴⁹ 31P -180.5, -181.0 ppm. ¹²⁴⁹

C₆H₅CH(CO₂Et)OPCl₂. Ia. b₂ 105-8°, d₄²⁰ 1.2827, d₄²¹ 1.2720, n_D²¹ 1.5259, α_D²⁰ -117.5° (l = 10 cm) from the (-)-mandelate α_D²⁰ -131.0°. ⁴⁵⁰

MÜNCHEN

Schwabe, Sandmair, Marx PO Box 860245 8000 München 86

ETHYL CORPORATION
Patent & Trademark Division
Attn: Ms. Patricia J. Hogan
451 Florida Boulevard
Baton Rouge, Louisiana 70801
U.S.A.

DIPL.-ING. HANS-GEORG SCHWABE
DIPL.-CHEM. DR. JUR. DR. RER. NAT. KURT SANDMAIR
DIPL.-PHYS. DR. RER. NAT. LOTHAR MARX

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Ihr Zeichen
Your ref
Votre ref

Unser Zeichen
Our ref
Notre ref

STUNTZSTRASSE 16
8000 München 80

Case 5585

50 789 V

July 12, 1988


European Patent Application No. 88 101 945.9

Dear Sirs,

Enclosed please find a copy of a Communication from the European Patent Office together with a copy of the European search report as well as copies of the documents cited. We have retained in our file copies of the cited references.

You will be informed as soon as the European Patent Office will have set a time limit for filing the request for substantive examination.

Yours sincerely,

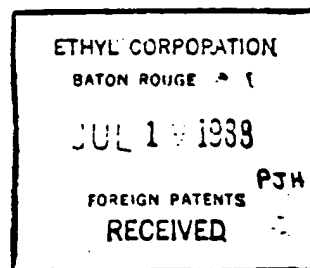

Dr. Kurt Sandmair

Encs:

Communication
European search report
documents cited therein

V/tl

ATTACHMENT "A"



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Recherchen-
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Search
Division

Division de la
recherche

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REPUBLIQUE FEDERALE D'ALLEMAGNE

1988

Datum/Date

0 8. 07. 88

Zeichen/Ref/Réf 50 789 V	Anmeldung Nr./Application No./Demande n°/Patent Nr./Patent No./Brevet n° 88101945.9- /
Anmelder/Applicant/Demandeur/Patentinhaber/Proprietor/Titulaire ETHYL CORPORATION	

COMMUNICATION

The European Patent Office herewith transmits

- ☒ the European search report
- ☐ the declaration under Rule 45 of the European Patent Convention
- ☐ the partial European search report under Rule 45 of the European Patent Convention
- ☐ the supplementary European search report concerning the international application number

relating to the above-identified European patent application, copies of the documents cited in the search report are enclosed

The Search Division approved the following items, as submitted by the applicant

- ☒ Abstract
- ☒ Title
- ☐ Figure
- ☐ The abstract was modified by the Search Division and the definitive text is attached to the present communication

- ☐ The following figure will be published with the abstract, since the Search Division considers that it better characterises the invention than the one indicated by the applicant

Figure:

- ☒ Additional copy(ies) of the documents cited in the European search report.



EPO Form 1507 08.86



EP 88 10 1945

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
Y	SU-A- 398 574 (A.M.KIM) * Whole document * ---	1,8-14	C 07 F 9/146 C 07 F 9/15 C 07 F 9/65 C 08 K 5/51
Y	US-A-3 254 050 (C.F.BARANAUCKAS) * Whole document * ---	1,8-14	
Y	US-A-3 281 506 (A.F.SHEPARD) * Whole document * -----	1,8-14	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			C 07 F 9/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03-06-1988	Examiner BESLIER L.M.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 88 10 1945

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on 27/06/88.
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SU-A- 393574		None	
US-A- 3254050		None	
US-A- 3281506		None	

Таблица

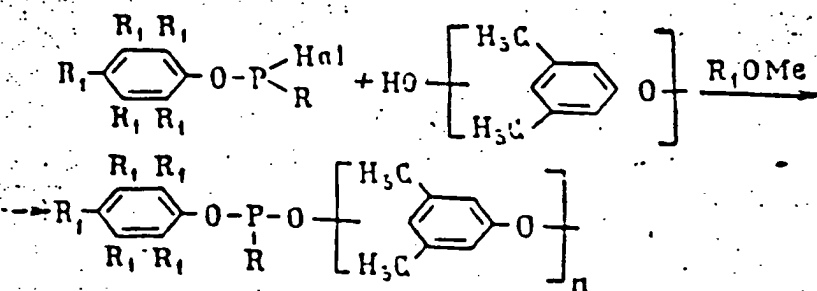
Полимер	Изменение разрушающего напряжения при растяжении в процессе прогрева пленок при 175°C, кг/см ²				
	0 суток	12 суток	24 суток	36 суток	48 суток
Исходный полимер	425	173	0	0	0
Полимер, обработанный дихлор-(пентаметилфенил) фосфитом	430	430	462	415	262
Полимер, обработанный дихлорфенилфосфитом	575	160	0	0	0

В качестве аминов могут быть использованы пиридин, пиперидин, анилин и другие

кипятят еще 2 часа. После охлаждения до комнатной температуры высаживают полимер добавлением 250 мл метилового спирта. Осадок отфильтровывают, промывают многократно ацетоном и сушат в вакуумном шкафу при температуре 80—100°C и остаточном давлении 100 мм рт. ст. Выход составил 95%.

Предмет изобретения

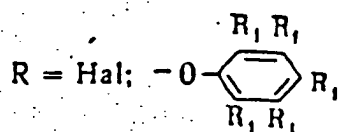
Способ стабилизации полифениленовых эфиров путем взаимодействия их с фосфорсодержащими стабилизаторами в присутствии аминов или алкоголятов щелочных металлов, отличающийся тем, что, с целью повышения устойчивости полифениленовых эфиров к воздействию высоких температур, в качестве фос-



где $\text{R}_1 = \text{C}_1 - \text{C}_{10}$ -алкилы;

$\text{Hal} = \text{F}, \text{Cl}, \text{Br}, \text{I}$.

$\text{Me} = \text{Li}, \text{Na}, \text{K}, \text{Rb}, \text{Cs}$



алифатические или ароматические амины. Реакцию лучше проводить при избытке галондфосфита.

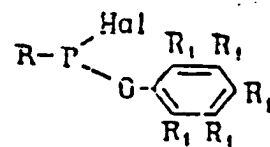
фосфорсодержащих стабилизаторов используют соединения общей формулы

Следующий пример иллюстрирует данное изобретение.

Пример 1. К раствору 10,0 г поли-2,6-диметил-1,4-фениленоксид (характеристическая вязкость 0,75 в бензоле при 25°C) в 130 мл толуола добавляют раствор метилата натрия, полученный добавлением 0,1 г натрия и 5,0 мл метилового спирта. Реакционную смесь кипятят 1 час, добавляют избыток дихлор(пентаметилфенил)фосфита (2,8 г) и

25 где $\text{R} = \text{Hal};$

30 $\text{R}_1 = \text{C}_1 - \text{C}_{10}$ -алкилы; $\text{Hal} = \text{F}, \text{Cl}, \text{Br}, \text{I}$



Составитель В. Поляков
Редактор Л. Емельянова Техред Л. Богданова Корректоры Л. Царькова и О. Тюрина

Знач. № 1289

Изд. № 1062

Тираж 65

Подписано

ЦНИИПИ Государственного комитета Совета Министров СССР

по делам изобретений и открытий,

Москва, Ж-15, Раушская наб. 1/5

МОТ, Загорский филиал

DECLARATION, POWER OF ATTORNEY, AND PETITION

Case No.
5585

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ANTIOXIDANT AROMATIC FLUOROPHOSPHITES

the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION SERIAL NO.	FILING DATE	STATUS
NONE		

And I hereby appoint Donald L. Johnson, Reg. No. 17,076; John F. Sieberth, Reg. No. 17,704;
Joseph D. Odenweller, Reg. No. 22,361All of Ethyl Corporation, 451 Florida Boulevard, Baton Rouge, Louisiana 70801; and Arthur G. Connolly, Reg. No. 13,416 of Farmers Bank Building, Tenth and Market Streets, Wilmington, Delaware 19899; or any one of them my attorneys or agents to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, said Donald L. Johnson and John F. Sieberth and either one of them to have full power of substitution and revocation, including the power to revoke the appointments of attorneys or agents herein made. Please make all telephone calls to Joseph D. Odenweller at (504) 388-8188.

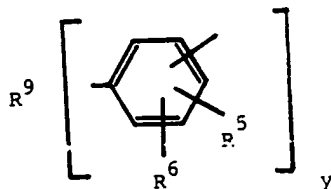
Address all correspondence to: Mr. John F. Sieberth, Patent & Trademark Division, Ethyl Corporation, 451 Florida Boulevard, Baton Rouge, Louisiana 70801.

WHEREFORE, I pray that Letters Patent be granted to me or us for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, declaration, power of attorney, and this petition.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

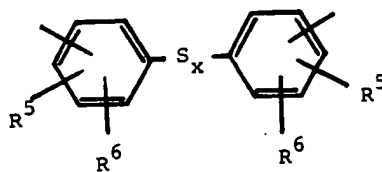
FULL NAME OF SOLE OR FIRST JOINT INVENTOR	INVENTOR'S SIGNATURE	DATE
LESTER P. J. BURTON	<i>Lester P J Burton</i>	Feb 24, 1987
RESIDENCE	CITIZENSHIP	
17321 Monitor Avenue, Baton Rouge, LA 70817	Canada	
POST OFFICE ADDRESS		
17321 Monitor Avenue, Baton Rouge, LA 70817		
FULL NAME OF SECOND JOINT INVENTOR, IF ANY	INVENTOR'S SIGNATURE	DATE
RESIDENCE	CITIZENSHIP	
POST OFFICE ADDRESS		
FULL NAME OF THIRD JOINT INVENTOR, IF ANY	INVENTOR'S SIGNATURE	DATE
RESIDENCE	CITIZENSHIP	
POST OFFICE ADDRESS		

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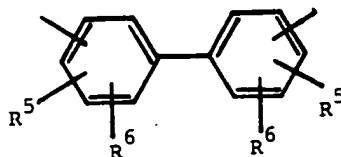
Structure IV (ii)

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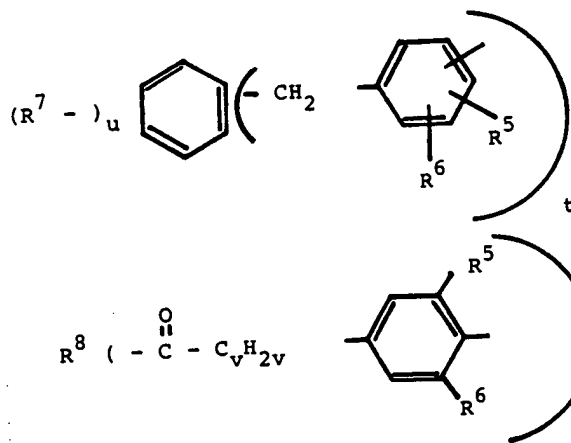
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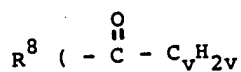


Structure IV (iv)

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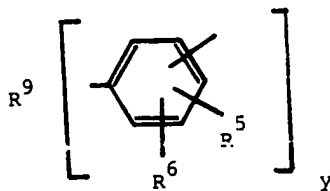


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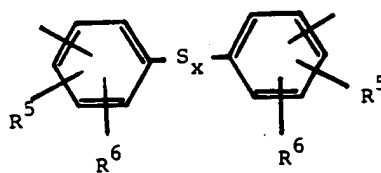
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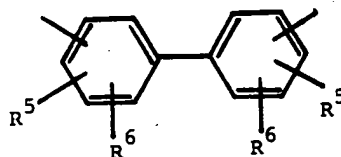
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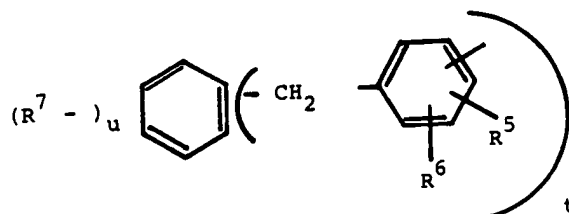
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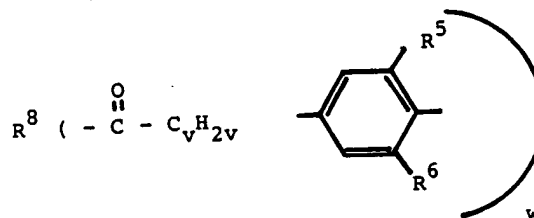
Structure IV (iv)

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Structure IV (v)

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Structure IV (vi)



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SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
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07/714441 06/13/91 Burton

EXAMINER

ART UNIT

PAPER NUMBER

1202

24112

DATE MAILED:

EXAMINER INTERVIEW SUMMARY RECORD

All participants (applicant, applicant's representative, PTO personnel):

(1) Ashley I. Pezner (3)

(2) M. Shah (4)

Date of interview 6/10/93

Type: ☐ Telephonic ☒ Personal (copy is given to ☐ applicant ☒ applicant's representative).

Exhibit shown or demonstration conducted: ☐ Yes ☒ No. If yes, brief description:

Agreement ☐ was reached with respect to some or all of the claims in question. ☒ was not reached.

Claims discussed: As of record

Identification of prior art discussed: As of record

Description of the general nature of what was agreed to if an agreement was reached, or any other comments: (1) Stamped post card copy has been provided for the declaration (2) The term "organic material" will be changed to "a polymer of an olefinically unsaturated monomer" (3) Claim 44 will be checked for possible interference with 4,962,144. (4) Support for Markush lang. has been provided on col. 2 lines 22-25 of the specification. (5) necessary modifications in other claims as well as declaration will be provided.

(A fuller description, if necessary, and a copy of the amendments, if available, which the examiner agreed would render the claims allowable must be attached. Also, where no copy of the amendments which would render the claims allowable is available, a summary thereof must be attached.)

Unless the paragraphs below have been checked to indicate to the contrary, A FORMAL WRITTEN RESPONSE TO THE LAST OFFICE ACTION IS NOT WAIVED AND MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW (e.g., items 1-7 on the reverse side of this form). If a response to the last Office action has already been filed, then applicant is given one month from this interview date to provide a statement of the substance of the interview.

☐ It is not necessary for applicant to provide a separate record of the substance of the interview.

☐ Since the examiner's interview summary above (including any attachments) reflects a complete response to each of the objections, rejections and requirements that may be present in the last Office action, and since the claims are now allowable, this completed form is considered to fulfill the response requirements of the last Office action.

Mukund J. Shah
Examiner's Signature